

VISCOSITY SENSOR SYSTEM

Field Of The Invention

The present invention relates to a viscosity sensor system.

Background Information

5 In the monitoring of liquids, in particular liquid materials used in engine operation such as motor oil, a number of chemical and physical properties of the liquid can be used to monitor its "state". An important criterion for monitoring the current state of the liquid is its viscosity η , which can be measured using a viscosity sensor.

10 For the measurement of viscosity, piezoelectric thickness shear vibrators, made for example of quartz, have long been used. See for example S.J. Martin et al., *Sens. Act. A* 44 (1994), pp. 209-218. If such a thickness shear vibrator is immersed in a viscous liquid, the resonance frequency of its natural oscillation, and its damping, change in a manner dependent on the viscosity and the density of the viscous liquid. Because for typical liquids the density varies much less than does the viscosity, practically speaking such a component acts as a viscosity sensor.

15 German Published Patent Application No. 101 12 433 discloses a viscosity sensor system having a piezoelectric sensor device that is situated entirely in the liquid that is to be measured and that has electrical contact points for an electrical control unit that are resistant in relation to the liquid, and having electrical supply lines that are resistant in relation to the liquid and that are connected on the one hand to a control and evaluation electronics unit
20 outside the liquid, and on the other hand to the contact points of the sensor device, by a suitable conductive glue provided with metallic particles.

Because in most liquids the viscosity is strongly temperature-dependent, it is necessary to simultaneously acquire the temperature T using a temperature sensor in order to evaluate the measurement data. In addition, each liquid has a typical temperature-viscosity characteristic
25 $\{\eta(T), T\}$ that depends on its state and that can easily be determined by measuring various viscosity-temperature value pairs $\{\eta(T), T\}$ and interpolating. This characteristic can be used alongside the acquisition of the absolute value of the viscosity, e.g. at a fixed temperature, in